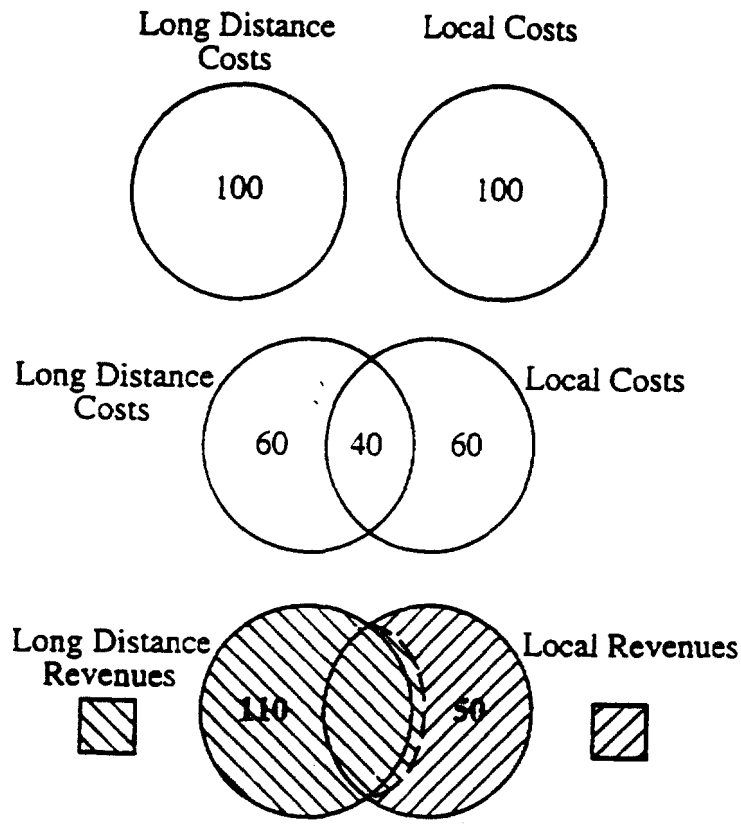
competitive entry. In this scenario, it is not the aggregate subsidy requirement at the moment at which competition is allowed which is important. It is the subsidy requirement that appears as competition develops which needs to be solved.

2. A similar phenomenon exists with subsidies that are not based on geographical averaging of rates but are the effect of one product or group of customers cross-subsidizing another. As in the previous example, the subsidy must be viewed over time, not at a single point in time.

   The next example pertains to the effects of limits on rate rebalancing with and without cross-subsidies coupled with open entry. The separated circles in Figure 2 represent the cost of producing each service (long distance and local) alone. This is called the "stand-alone cost" of each service. The cost of producing the services together is less than the sum of the stand-alone costs in the presence of "economies of scope". In this example, the stand-alone cost of each service is 100, the incremental cost of each service is 60, and the common cost of the two-product firm is 40. A cross-subsidy exists because: 1) local service is being subsidized (revenues are less than incremental cost) *and* 2) long distance service is providing the subsidy (revenues exceed its incremental cost plus the common cost).

Figure 2



If entry were prohibited, this cross-subsidy might be sustainable. If competitive entry is open (*i.e.*, there are no barriers to entry), then a stand-alone supplier of long distance service would seek the opportunity to achieve extraordinary profits and displace the incumbent's long distance market. This would not only necessitate raising local revenues to incremental cost, but would require revenues to rise to equal stand-alone cost. Of course, neither of these (now) stand-alone companies would survive since the next opportunity is for a two product company (costing 160) to displace the two stand-alone companies (together costing 200). The surviving company must, of course, price both long distance and local services so that each product's revenue lies between stand-alone cost and incremental cost.

This example illustrates the reason why competition drives out cross-subsidies. Open entry and cross-subsidies cannot persist together.

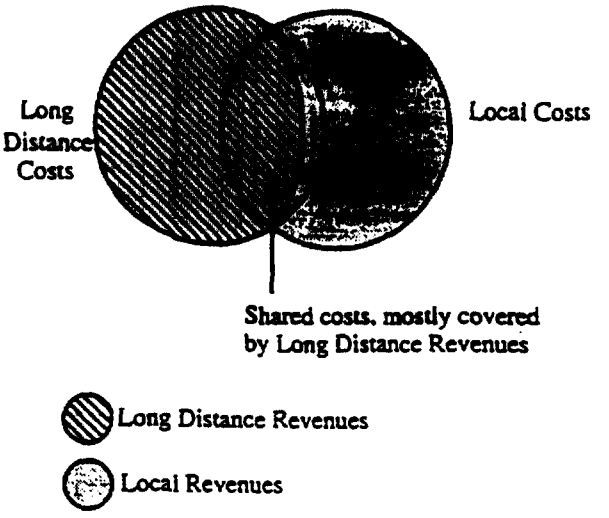
Limits on rate rebalancing, especially requirements to price at or X% above incremental cost, can lead to inefficient entry. The above example can be extended to illustrate an important source of such inefficiencies. Imagine that local rates are set equal to incremental cost (yielding 60 in revenue). Long distance must now be priced at 100 (stand-alone cost). If another firm with a different scope of services could less efficiently add toll services (say, for an incremental cost of 80), then the alternative supplier would displace the incumbent in the toll market just as the stand-alone firm did in the previous example. The outcome is unnecessarily high cost of all services. Once inefficient industries are in operation, there are often additional inefficiencies created by various uses of regulatory and legal processes to preserve the resulting interests.

This latter extension of the example suggests that, for the purposes served by these examples, "stand-alone" cost is best defined as the incremental cost of entry rather than the cost of entry calculated as if the most efficient entry were the literal stand-alone supply of a service.[6] For example, toll rates (or other non-basic service rates) historically have been set sufficiently above cost to compensate for local rates (or other basic service rates) that are below cost.

3. In this next example, toll rates have been set to bear an unsustainable majority of shared and common costs of the company. As before, the circles represent the costs of providing long distance alone and local alone, respectively. The overlapping area is the cost common to both local and toll. As shown, since local service revenues are far less than the cost of providing local service alone, toll services bear the majority of common costs.

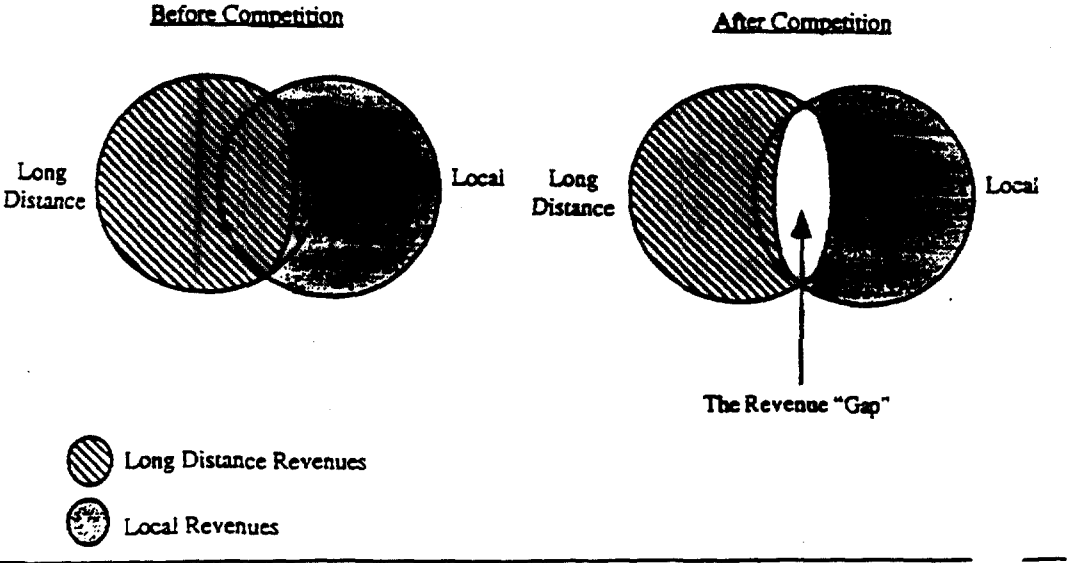
[6] I have argued elsewhere that this is *not* the appropriate definition of stand-alone cost for purposes of detecting cross-subsidies within a firm.

Figure 3



Although neither local nor toll is being cross-subsidized in this example (each is priced above its respective incremental costs), the need for a subsidy appears as competition enters if rate rebalancing is restricted. To see this, assume that the incumbent provider has revenue sufficient to cover all costs before competition. Like low cost areas with averaged rates, the toll markets are very profitable (have high contribution) and therefore are attractive to new entrants. As competition enters, the incumbent's costs decline very little due to the largely fixed infrastructure cost required by the widespread availability policy (the cost decline is ignored in the picture below). Revenues erode more rapidly as shown.

Figure 4



A gap between revenues and *total company* costs appears. The incumbent, must close this gap and recover its total costs if it is to remain viable. This gap can be (partially) closed in some combination of three ways:[7]

1. rebalance rates so that local revenues are increased to fill the gap,

2. provide external subsidy payments to the incumbent equal to the gap, or

3. structure interconnection charges so that the gap is automatically filled by revenues from competitors which grow precisely as the gap grows.

Unlike the previous example, this requirement for CSO funding does not derive from a cross-subsidy (although cross-subsidies exacerbate the size and persistence of the subsidy), but derives from a combination of the obligation to provide widespread availability of service (thus restricting cost reductions enabled by withdrawing from local service to match the competitors' services and cost) and the policy of Affordable Rates (which restricts rate rebalancing).

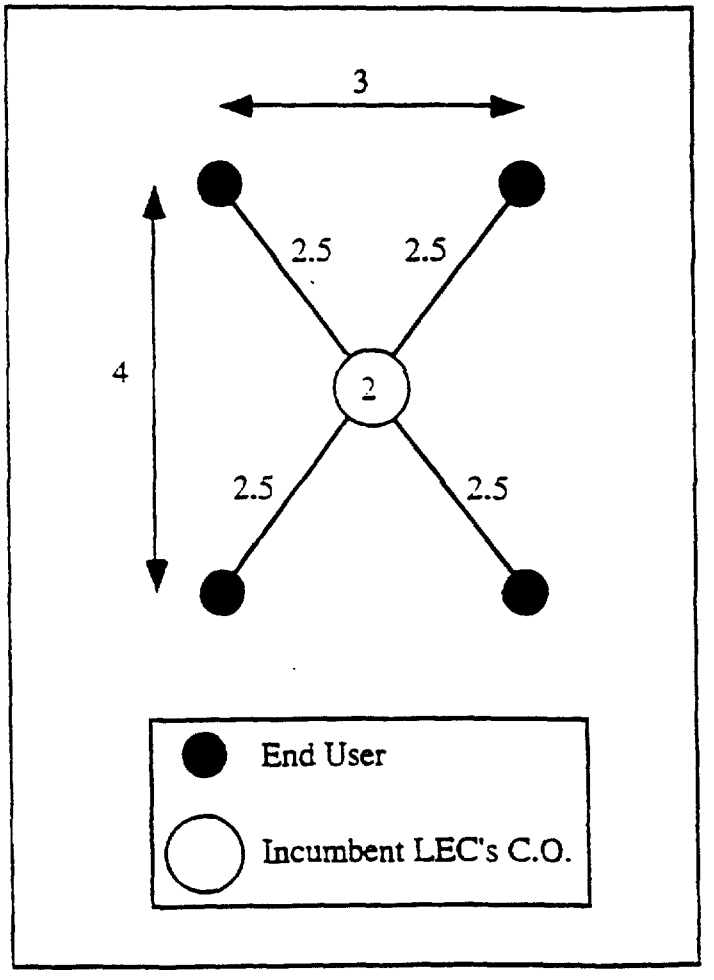
Whether a firm in the situation of the last examples *should be* subsidized is an issue which requires some attention. The conclusion will be that subsidies will normally not be required unless a subset of suppliers has constraints or burdens not assumed by other competitors. Otherwise, subsidy payments will need to be provided from external sources or restrictions on entry must be used to protect cross-subsidies, assuming, of course, that the obliged or protected supplier constitutes the efficient means of supply.

Consider the example in which both long distance and local services made a positive contribution towards common cost but a "gap" appeared as competition entered (see Figure 4). In this case, the rate constraint on long distance service was imposed by the incremental entry cost of the competitor while the constraint on local was imposed by regulatory mandate. Were *both* constraints due to the incremental cost of entry, no subsidy should be provided since the incumbent firm has economies of scope, but the economies are not as great as the competing firm(s) which provide the constraints. This is surprising. Notice that the incumbent firm (depicted in Figure 4) has lower *incremental* costs (represented by the revenues obtainable from the two services -- presumably, other firms would enter (so long as the opportunity to earn a competitive return is included in the incremental cost as we always assume here).

[7] For this simple example, we assume that the firm remains a "two product" firm and is operating efficiently given its service obligations.

4. The policy of Widespread Availability by itself can require subsidies even without cross-subsidies and without restricted rate rebalancing.

Figure 5

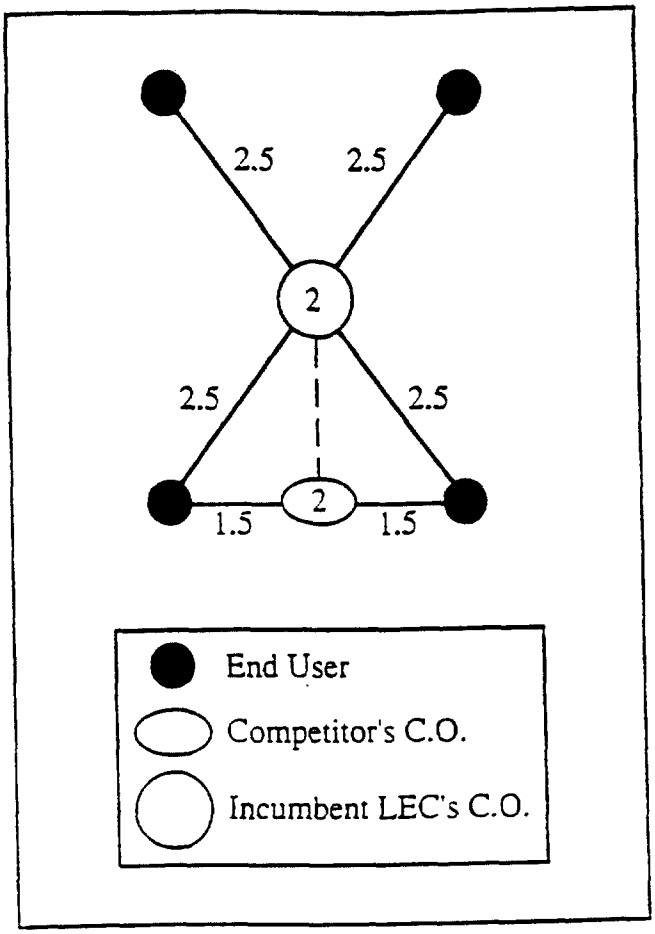


For the sake of simplicity, let us imagine that the cost of serving each end user is proportional to the distance over which traffic travels and a single fixed cost switch can serve two or more users. In this case, the most efficient means of serving traffic between any two locations is through a centrally located central office to which all communication routes connect. A new entrant could serve two of the locations less expensively if it were not obliged to serve the entire geographical area. For example, a new entrant could provide service between any two locations at a lower cost by virtue of a direct connection between the two (locating its central office midway between two end users).

To put numbers in the example, the central office cost is $2 for both the LEC

and the competitor, the LEC's incremental access cost is $2.50 per end user, and the competitor's transport cost is $1.50.[8] In this situation, the LEC's total cost is $12 while the competitor's total cost is $5. In order to remain competitive, the LEC, therefore, cannot price its service above $2.50/end user. Pricing at such a level, however, would not provide the LEC with enough revenue to cover the costs incurred ($10 < $12). The LEC would require a subsidy of $2 in order to continue to meet the widespread availability criterion. While the LEC could not survive in this example without a subsidy to the entire company, it is important to note that there is no *cross*-subsidy. That is, the revenue received from each end user *is* (exactly) sufficient to cover the direct incremental cost of service but provides no contribution towards the common cost of the firm.

Figure 5



[8] Note that the entrant's transport cost to serve a proper subset of the market will always be lower due to the shorter distance between end user and its central office.

Table 2 below summarizes the potential costs and revenues of the LEC under a situation in which no interconnection requirement is imposed on the two carriers. Remember that the cost to the LEC will not change no matter how many of the potential customers it serves because the LEC continues to have a COLR obligation and therefore must continue to maintain facilities to all four of the customers. Thus, if the LEC were to lose two of the customers to competition, the required subsidy would rise precisely by the aggregate revenue (2 x $2.50 = $5) lost.

Table 2: No Interconnection Requirement

	Price	Quantity Served	Total Revenue	Total Cost	Subsidy Required
LEC Retains All	2.50	4	10.00	12.00	(2.00)
LEC Loses Two	2.50	2	5.00	12.00	(7.00)

In summary, a Widespread Availability obligation can require a subsidy even if no individual segment of the business is being subsidized.

The implied message of these three examples is that the problem of preserving community service obligations, coupled with opening previously franchised monopolies to competition, requires a coordinated and carefully designed set of public policies which reap the benefits of competition and preserve the public policy benefits of the community service obligations. All four CSOs must be considered together when determining the "cost" of maintaining the group of obligations described as "universal service," and assessing how to meet those obligations as competition substitutes for regulation.. Well meaning but poorly chosen policies regarding these matters can result in higher consumer prices, unfair competition, and economic inefficiencies.

IV. CSO COST RECOVERY MECHANISMS

The LEC having the CSO must be provided the opportunity to recover its costs if the CSO is to be preserved. In this section, we identify and evaluate alternative recovery mechanisms. Alternative sources of funding the CSO will be explored. These funding sources may be found among the services offered by the LEC with the CSO, or may be provided from external sources.

Objectives

An economically sound and viable contribution mechanism must satisfy two objectives. First, once the level of contribution to be recovered from the sources in question has been anticipated, it should be assessed in a manner that distorts the efficiency properties of competitive outcomes as little as possible.[9]

The economic efficiency objective requires that contribution assessment be borne by all competitors -- both incumbents and new entrants -- in a manner which preserves each competitor's relative efficiency in the market contests. That is, when the incumbent competes with new entrants, (1) all entrants should pay some funds to the carrier(s) having the CSOs on an equitable and nondiscriminatory basis and (2) the incumbents' competitive retail services should not be required to bear more (or less) of the funding burden than the new entrants' substitute services.[10]

In addition, it is highly desirable to use recovery mechanisms that are easy to understand and require minimal regulatory oversight once established. Below, three sources of funding are discussed and evaluated. It is likely that all three will be required in some combination if both competition and public policies promoting community services are to coexist in the new environment.

Alternative Methods

The problem of funding the various components of the CSOs should be addressed in three stages. The first stage is to attempt to correct the geographic and product cross-subsidies illustrated in the first and second examples provided in this paper Deaveraging rates to the greatest extent possible so as to minimize the need for a subsidy flowing from low cost areas to high cost areas is a desirable first step. For example, if prices were set at or above cost across all geographical areas, then there would be no appearance of geographic subsidy requirements over time as market shares shift.[11] To the extent that there are public policy or other reasons why rate rebalancing to the full extent of costs is undesirable, the remaining subsidy will need

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[9] Establishing the target level of contribution, itself, has efficiency implications. The choice of raising funds from certain services, (*e.g.*, new information services) rather than elsewhere (*e.g.*, subscriber loops), affects consumers' (and producers') choices, thus affecting economic efficiency. Since there is some degree of control over where contribution can be raised, because all services are not fully competitive, both public policy and economic efficiency concerns are likely to be considered when targeting contribution recovery to particular services.

[10] That is, at the price floor (minimum price), the LEC's retail service has the same contribution as the interconnection service. Demand conditions may be such that the LEC could charge a price above the floor, thus providing greater recovery of contribution.

[11] There would, of course, be a temporary need for a subsidy (long run costs are reduced slowly), but there would not be a long term need for such a subsidy. The temporary need appears in the form that not all of the costs incurred are avoidable in the near term. These costs are only avoidable in the long run which effectively occurs at the point at which the facilities would have been replaced based on engineering economy considerations.

to be calculated, and a funding mechanism will need to be developed.

Concurrent with geographical rate deaveraging, one should attempt to resolve the cross-product subsidy issue illustrated in the second example presented in this paper. Competitive services will not be able to continue to subsidize the universal service obligation because the contribution from those services will be eroded by competition.

Cross-subsidies are measured by comparing the revenues from a segment of the business (a geographical area or a product, for example) with its *incremental* costs.[12] Note that cross-subsidies are masked when segments are aggregated. For example, in our earlier example (Table 1) there appears to be no subsidy in the aggregate. The subsidy (in that example, a cross-subsidy in which the high density area subsidized the low density area) was founded at a more disaggregated level. Thus, measurement and correction of the cross-subsidy problem must involve disaggregated incremental cost studies. While it may be difficult or even impossible today to examine subsidies at the level of individual or each thousands of services, it is important to avoid too much aggregation. For example, the wire center level of geography is likely to be too aggregate; large product groups (*e.g.*, all central office features) are likely to be too aggregate.

Whatever level of aggregation is selected as practicable, it is incremental cost studies, compared to the associated revenues, which are required to measure and eliminate cross-subsidies.

Funding the COLR Subsidy

After calculating the subsidy necessary to fund universal service obligations stemming from geographic averaging and the erosion of subsidy funds from competitive services, the final layer of funding must be identified. This final layer or stage of funding examines the costs associated with the carrier of last resort (COLR) obligation which was illustrated in the third example of this paper.

After rebalancing rates as far as is politically acceptable in order to alleviate subsidy needs based on geographic averaging, and after eliminating cross-product subsidies to the greatest extent possible, the funding of the remaining universal service subsidy should come from three sources — interconnection charges, taxes, or end user "surcharges". In measuring this portion of the subsidy requirement, one needs to measure the difference between the revenues from the services associated with

[12] While revenues *equal to* incremental costs avoid a subsidy (and therefore a cross-subsidy), a local exchange company needs more revenue in order to avoid subsidizing groups of products or geographical areas having shared costs. Even more revenue is required to cover common costs of the company.

obligatory community services and the their respective costs after restructuring rates to eliminate or reduce cross-subsidies. It is important to remember that it is the revenues and costs of the entire family of community service obligations which is relevant, not the sum of the individual services' revenues and costs (this subject is taken up in the next section). Even more important is to remember that one should *not* compare community service obligation costs with competitive service revenues.

The (re)structuring of interconnection charges is a mechanism for funding the remaining universal service subsidy. There are strict limits on the ability to use such a mechanixm, however. The limits on the ability to fund this through interconnection charges are essentially bypass costs. That is, interconnection charges are effectively capped at an amount which is no greater than the *incremental* cost of bypassing the local exchange company. Note that this cap is the incremental cost to the competitor of bypassing the local exchange company. As technology advances over time to offer more and lower cost means of entry and bypass (*e.g.*, telephony on cable television, cellular radio, etc.), the incremental cost of bypass is falling. Thus, even if interconnection charges can be structured to entirely fund the currently existing universal service subsidy, it is likely that such charges will soon, if not already, fail to provide sufficient subsidy funds.

Returning to our earlier example (following from table 2), let us consider interconnection costs and revenues. If an interconnection agreement between the LEC and the competitor is established such that the $2 interconnection cost is shared equally by both carriers, the cost structure, and therefore the price structure, of the two carriers will change. The LEC's total cost now rises to $13 while the competitor's cost rises to $6. The LEC can now price its service at $3 per customer but no higher if it intends to remain competitive. As table 3 illustrates, the LEC's total cost and total revenue thus increase by an equal amount ($1), leaving the subsidy required unchanged.

Table 3: Interconnection Costs Shared

	Price	Quantity Served	Total Revenue	Total Cost	Subsidy Required
LEC	3.00	2	6.00	13.00	(7.00)
Competitor 0.00		3.00	2	6.00	6.00

Even if the new competitor is required to pay 100% of the interconnection cost (which is often the case with collocated facilities), a substantial subsidy may still be required. In our example, while such an arrangement slightly reduces the LEC's subsidy requirement, a substantial subsidy is still required. The competitor's total cost of serving its customers is $7, thereby allowing the LEC to price its service at

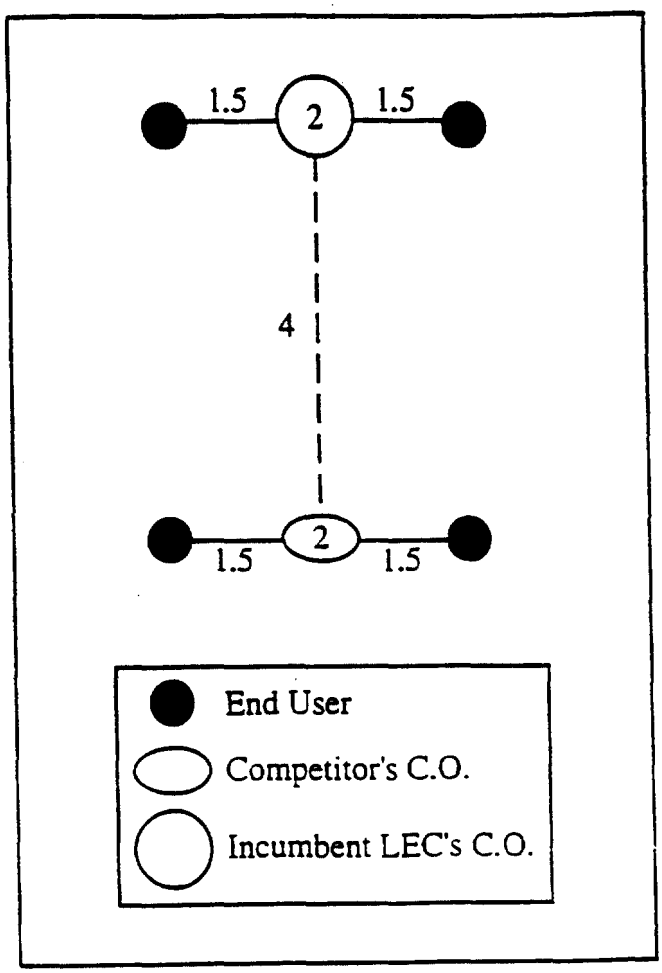
$3.50 to each customer. This increase in revenue to the LEC ($2), coupled with no increase in total cost (still $12), reduces the LEC's subsidy requirement to $5.

Table 4: Interconnection Cost Paid by Competitor

	Price	Quantity Served	Total Revenue	Total Cost	Subsidy Required
LEC	3.50	2	7.00	12.00	(5.00)
Competitor 0.00		3.50	2	7.00	7.00

The analysis thus far has assumed that the incumbent LEC retains the COLR obligation and must maintain available capacity sufficient to serve all end users. Now consider the situation that would develop were the LEC to be permitted to withdraw from the COLR obligation and/or transfer the obligation to another company with interconnection requirements between the two carriers. In this case, it may no longer be necessary or advantageous for the LEC to continue to maintain facilities to all four of the customers. In fact, it would be most beneficial for the LEC to situate itself in exactly the same manner as the Competitor. That is, a situation would develop as depicted in the diagram below.

Figure 6



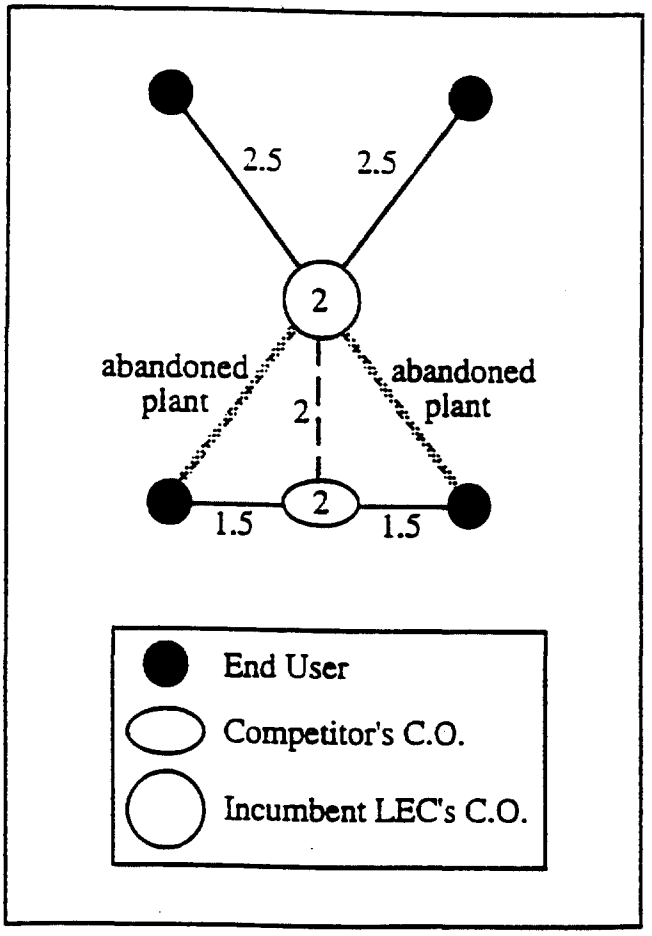
The cost structures of the two carriers are now perfectly symmetrical if we assume that the interconnection charge ($4) is shared equally between them. That is, each carrier incurs $7 in total costs.

It is important to realize that the LEC, by withdrawing from its COLR obligation, makes the adjustment to the situation depicted above only in the long run. This abandonment of the existing network, and subsequent construction of a new network which interconnects with the old network, has two noteworthy implications. First, the economic life of the existing network is affected by competitive entry. It is likely, however, that this new competition was not anticipated and therefore not accounted for in the currently employed economic life estimates. The LEC therefore must be able to increase depreciation rates so as to reflect the expected rate of abandonment. Second, it is only economical for the LEC to make such a change when it becomes time for the LEC to replace its existing plant. It would normally not be economical to make the change immediately. Most likely, the LEC would find that it would be more economical to continue to pay the operating and maintenance expenses of its existing plant serving its two remaining customers than

to build all new plant at the initiation of competition.

A further complication arises here if the LEC is forced to include sunk costs in its price estimates. Under a "no sunk cost" rule (applied to its remaining two customers, not to the lost customers), the LEC's total cost would be $8 while the competitor's cost would remain at $6. This cost differential creates a potential price umbrella under which the new entrant can price (the LEC must price at or above $4 while the competitor can price down to $3). Because the LEC is saddled with recognizing the cost of abandoned plant, not only is there the possibility of a price umbrella, but there is also the potential for underrecovery of that abandoned plant.

Figure 7



In summary, the cost rule that provides for a price floor and the decision as to whether the universal service obligation does or does not remain with the LEC have to be considered together. That is, the implications of keeping the universal service obligation with the LEC or allowing it to be transferred or abandoned, together with the rules governing price floors (*e.g.*, a "no sunk cost" rule), can lead to inefficient outcomes and inefficiently high prices.

Finally, consider the limits on interconnection charges imposed by bypass costs. If the second carrier must interconnect to reach all carriers, interconnection charges can be obtained in excess of the cost of interconnection. Note that the cost of complete bypass as depicted in Figure 4 is $14. The LEC could obtain no more than $7 from the new carrier in additional interconnection charges.[13]

In this example, the subsidy requirements of the incumbent LEC can be entirely met with interconnection charges. However, as the costs of bypass fall with new technologies and resulting lower bypass costs, there may be a need for additional funding. Indeed, there may be political or public policy limits well below the bypass limits which require we look to other sources of funding. It is to the next source of funding we now turn our attention.

In order to generate the funds necessary to make up for the difference between the universal service subsidy requirement and the contributions from interconnection charges, a tax and/or end user surcharge system could be implemented. In order to ensure the full funding of the remaining universal service subsidy, the taxes should be structured such that there is no practical means of bypassing them. This effectively means that the taxes must be levied upon the subscribers to *all* communications services. As is the case with interconnection charges, however, there exists the possibility that tax contributions will fall over time as technology advances to the point where other types of services can effectively be used to bypass "communications" services. For this reason, a properly constructed system of end user surcharges should be implemented. A end user surcharge could take the form of a conversion of an access charge currently levied upon carriers to an access-like charge levied upon end-users. In this manner, the necessary funds would continue to flow to the carrier of last resort regardless of whether or not that carrier was bypassed by competitors. While the conversion of access chrges to end user surcharges preserves much of the present funding structure, more generally, end user surcharges could have any of a number of structures.

End User Surcharges

Recently, revenue surcharges have been discussed as a mechanism for funding the CSO. Revenue-based surcharges function like a sales tax assessed to all providers of selected services. That is, a certain percentage is assessed to total revenues (sales) of the services in question. This approach has some regulatory precedent. For example, in California, a percentage assessment is applied to the revenue base of all carriers to provide funds to subsidize lifeline services.

Once the level of the contribution recovery has been established and the surcharge

[13] The new carrier's cost is assumed to be $1.50 + $1.50 + $2 (switch) + $2 (interconnection cost) = $7. No more than an additional $7 could be collected without incenting the new carrier to bypass the incumbent entirely.

rate has been set, the pricing of the interconnection services and the LEC's competitive services is straightforward. Apart from the surcharge, interconnection is priced at cost, and the price floor for the LEC's competitive services are also set at cost.[14]

In addition, the revenue surcharge approach has attractive economic properties. In particular, economists have long recognized that outputs, rather than inputs, should be subject to taxation.[15] Because LEC interconnection services are inputs to the competitors' services, it becomes difficult to avoid what is, in effect, taxation of inputs when contribution is recovered through access prices set above cost. In contrast, the revenue surcharge focuses on outputs.

There are three potential difficulties with this approach. First, the maximum benefit from the approach may require variation of the surcharge rate across competitive services. While this requirement is no more onerous than varying the contribution element across services in our previous case, arriving at the correct rates could require considerable care. Second, because of its resemblance to a tax, the approach may have some political difficulties. That is, regulatory commissions may be reluctant to assess "taxes." Third, assessing contribution in any form would raise the same objections discussed earlier that competitors should not be forced to recover LEC overheads. Again, such arguments are equally invalid in the case of a revenue-based surcharge as they are in the context of a contribution element.

[14] Because of the surcharge, both competitors and the LEC face prices that are above incremental cost.

[15] Peter A. Diamond and James A. Mirrlees, "Optimal Taxation and Public Production," American Economic Review, Vol. 61, 1971, pp. 8-27.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that copies of the foregoing **Comments of Cincinnati Bell Telephone Company** have been delivered by first class United States Mail, postage prepaid, on April 12, 1996, to the persons on the attached service list.

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